coronagraph operated by Mr. F. McClean obtained a fine photograph of the corona with excessively sharp detail and good extension. The De la Rue coronagraph in charge of Lieut. Trench, R.N., was fortunate enough to secure three negatives, all of which will be very serviceable, as the focus was so well adjusted. Unfortunately the long exposures required for the three-colour camera operated by Lady Lockyer could not be secured in consequence of clouds. The $3\frac{1}{2}$-inch Newton, mounted equatorially and worked by Staff-Surgeon Clift, obtained two successful exposures. The instrument in my charge secured four negatives that will prove useful, one of which displays the green coronal ring clearer than those which were secured in the 1898 or 1900 eclipses, and several other distinct coronal rings in addition. The spectrum of the lower chromosphere at the beginning or end of totality was not obtained. The objective grating spectroscope worked by Mr. Howard Payn produced one out of two exposures made, and shows the spectrum of the larger prominences and the green coronal ring.

The observers of the shadow bands gained a great amount of information as regards their size, rate of motion, and direction. The coronal sketchers obtained very concordant results, and the other parties gleaned much useful information, which will be published later, as the observations have not yet been brought together.

By the evening of Sunday, September 3, the whole of the instruments, tents, dark room, and smaller huts were comfortably on board, and we steamed away to Palermo, leaving our camp as bare as we found it. Two copies of each negative had been made and separately packed to ensure loss against accident.

With the exception of Mr. Butler, who proceeded to Malta in H.M.S. *Venus*, and of Mr. Payn, who remained at Palma, our party bade farewell to the officers and men of H.M.S. *Venus* who had worked so hard, and whom Dame Nature had treated so badly. Crossing to Naples, where we left Mr. F. McClean, we took the train the same morning to Rome, and after a short rest and a little sight-seeing journeyed to Innsbruck, travelling through the beautiful Brenner Pass, to attend the meeting of the Solar Commission of the International Meteorological Committee. Perhaps by the time that the next eclipse occurs we may know a little more about "weather" to enable observers to go to regions where they will not be totally or even partially clouded out!

WILLIAM J. S. LOCKYER.

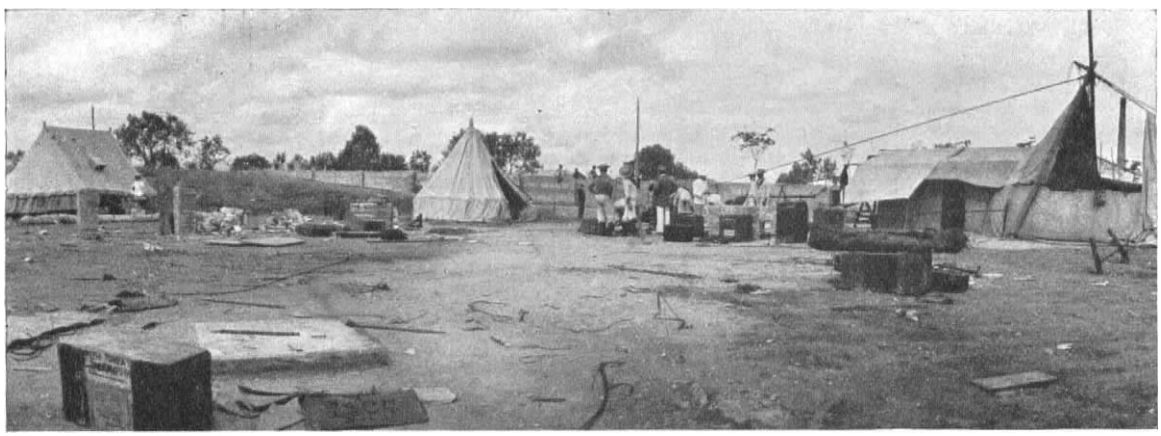

FIG. 5.—The camp four hours after the eclipse, showing how quickly the instruments were removed.

INTERNATIONAL METEOROLOGICAL CONFERENCE AT INNSBRUCK.

THIS International Meteorological Conference was opened at Innsbruck on September 9, when Dr. Hildebrandsson, the secretary of the International Meteorological Committee, read the report of the operations of that body on the part of M. Mascart (president) and himself, and explained that at the Southport meeting in September, 1903, Dr. Pernter's proposal that a conference of the directors of meteorological services should be held at Innsbruck this year, similar in character to those at Munich in 1891 and Paris in 1896, was favourably regarded and subsequently adopted.

The vacancies which have occurred on the committee from various causes have been filled by the appointment of Dr. Palazzo and Dr. Shaw in succession to Prof. Tacchini and Dr. Scott. Dr. Hildebrandsson was elected secretary on the retirement of Dr. Scott, who, since the creation of the committee, had performed this function with a zeal and devotion which would be most gratefully remembered. The following changes have also been made:—M. Chaves, director of the Meteorological Service of the Azores, was appointed in place of Admiral de Brito-Capello, Dr. Hellmann in succession to Prof. von Bezold, and M. Lancaster in succession to M. Snellen.

Sir John Eliot, having ceased to be director of the Indian Meteorological Service, tendered his resignation as a member of the committee, but, with the approval of the India Office, communicated through Dr. Shaw, the committee invited him to retain his seat, as representing in Europe the Meteorological Service of India. Thus the committee has the great advantage of counting among its members residing in Europe a man of experience and possessing a thorough knowledge of the meteorology of the tropics.

According to the report presented by M. Wild and Dr. Scott to the conference at Munich, and adopted

by it, the principal object of these private conferences of the directors of meteorological services was "the discussion of concrete questions, the arrangements of procedure as to methods of observation and calculation, and the organisation of common investigations." Since that period several investigations have been organised by the subcommittees nominated by the international committee.

The Munich conference nominated a committee for cloud observations, under the presidency of Dr. Hildebrandsson, whose duty it was to publish an international cloud atlas, and to organise and direct observations and measurements of clouds in different countries during a year. The cloud atlas was published in 1896 by MM. Hildebrandsson, Riggenbach, and Teisserenc de Bort. International cloud observations and measurements were made at a great number of stations from May 1, 1896, to the end of 1897, on a plan fixed by the committee at the meeting at Upsala in 1894. The publications, in accordance with instructions laid down by the subcommittee, have appeared, and the principal results have been published by Dr. Hildebrandsson in a report of which the first part was presented to the international committee at the Southport meeting, and the second part is now presented to the conference. The subcommittee has now completed its work.

At the Paris meeting, in 1896, other subcommittees of a similar character were nominated, *e.g.* an aëronautical committee, with Dr. Hergesell as president, for the purpose of organising international scientific aëronautical experiments, especially simultaneous balloon ascents at different stations. A committee was formed under the presidency of Sir Arthur Rücker for the purpose of international researches on terrestrial magnetism and atmospheric electricity.

These subcommittees have had several meetings, and have organised some important investigations. A third subcommittee was constituted at Paris in 1896 for the study of solar radiation. There have been no special meetings, but M. Violle has presented to each sitting of the international committee a report of the principal researches undertaken in different countries. At the St. Petersburg meeting, in 1899, the international committee appointed a telegraphic subcommittee, under the presidency of Dr. Pernter, with the view of suggesting possible improvements in telegrams for weather prediction. Lastly, at the request of Sir Norman Lockyer and Dr. Shaw, the committee appointed a subcommittee for the study of questions relating to simultaneous solar and terrestrial changes, under the presidency of Sir Norman Lockyer.

The reports of these subcommittees show that their labours have been of the greatest utility for the development of meteorological science. By this means it has been possible to organise and carry out successfully investigations which would have been otherwise impracticable. It is very desirable that all persons occupied with the same or analogous problems should meet periodically, in order to fix ideas and coordinate individual efforts, without in any way restricting personal initiative. It may be asserted with satisfaction, added Dr. Hildebrandsson, that the meteorological conferences organised more than thirty years ago have materially contributed to the development of the science, to uniformity of views, and to agreement between the services of different countries. The constitution of the international committee contributes effectively to the maintenance of good relations, and promotes continuity in the labours of the conferences.

Dr. J. Hann was elected honorary president, and Dr. J. M. Pernter president, of the conference. In the course of an address Dr. Hann said:—

As I am not the official president, I shall take advantage of my privilege of passing over in silence most of the questions which form the programme of the present conference, and I shall devote my attention to certain problems of modern meteorology in which I have a special interest, and the solution of which your discussions will assist.

The use of balloons and kites has brought the exploration of the upper regions of the atmosphere to a degree of development of which we had no idea at the time of the first international congresses at Leipzig and Vienna. Even in 1879 the condition of the question had not changed, when at the congress at Rome I was charged with elaborating plans for observations in balloons and on mountains. We had not then the apparatus for raising kites, and had no idea of the important part they were to play in meteorological science. It was reserved for Messrs. Rotch and Clayton, of Blue Hill, to obtain the excellent results with which we are all acquainted.

Further, unmanned balloons were not invented, which since, thanks to M. Teisserenc de Bort, have furnished such surprising data relating to the temperature of the upper regions of the atmosphere. The exploration of the air by means of manned balloons was carried on without any regular plan, and the observations obtained, as we found out later on, were unsuitable for scientific investigations. It was only more recently, after the older experiments by Welsh had been overlooked and forgotten, that Dr. Assmann produced his aspiration-thermometer, which is capable of giving accurate temperature observations during balloon ascents.

Thus I was only able to recommend observations in captive balloons. I directed attention to the superiority of such observations over those made on mountain summits, which were subject to the disturbing influence of the ground, and gave a daily range of temperature quite different from that observed in free air.

But as observations in captive balloons were limited in several respects, I also recommended that observations should be made on mountains. Mountain observations, although subject to local influences, are of great use; they give us information that observations made in balloons or by means of kites cannot do, viz. the continuous registration of meteorological elements (especially barometric pressure) at a definite altitude, and are indispensable in determining the conditions of the weather in the higher regions of the atmosphere.

I now come to another domain of research, which at the present time has attained increased importance, viz. the problem of weather periods and their connection and dependance on the activity of the sun. This is one of the grandest and most beautiful problems of modern meteorology, for the solution of which astronomers, physicists, and meteorologists must give mutual assistance. One of the services which meteorologists can render in furthering this important object is to obtain suitable observations, by means of which the cyclical variations in the atmosphere and their relations to solar activity may be unequivocally determined.

These observations must fulfil two principal conditions; they must be distributed as uniformly as possible over the globe in order to give sufficient data relating to the conditions of the atmosphere at fixed moments, and must be suitable for closely following the variations in time of these conditions during short as well as in very long periods. The meteorological observations at fixed points must give continuous and homogeneous series of mean and extreme values.

Unfortunately, the older observations do not always satisfy these conditions. It often happened that the principal meteorological observatories, while constantly endeavouring to obtain more exact data, omitted at the same time to take steps for obtaining comparisons between the old and the new series of observations. This remark applies above all to certain barometrical observations. Thermometrical observations subject to local influences, as well as barometrical observations affected by large or unknown instrumental errors, may afford valuable means for determining the variations of meteorological elements, provided that the local influences and the corrections are

constant. These are even more valuable than absolutely accurate observations that are not homogeneous, because the constant errors do not affect the variations. Accordingly I have for many years urged in the *Meteorologische Zeitschrift* that we should endeavour to continue the homogeneous series of means and extremes of the meteorological elements for as many years as possible, and should collect and critically discuss the older series of observations.

Considered from this point of view, the continuation of meteorological observations on mountains is of special value and most urgently to be recommended. They give us information about the condition of the atmosphere in the higher regions which are less exposed to local influences.

Among the results of recent researches, no other has made so great an impression on me as the observations of the British Antarctic Expedition on the retrograde motion of the glaciers now going on in those regions. The renowned great ice-barrier of James Ross has receded thirty miles; the glaciers of Victoria Land are in full retreat, and no longer reach the sea; while, on the other hand, the Arctic glaciers are receding, and travellers report the same thing about the glaciers of the snow-covered mountains of Ecuador and East Africa.

Comparing these facts with reports and observations of the progressive desiccation of Africa and Central Asia, we are confronted with one of the greatest problems of terrestrial physics. This appears the more difficult of solution since we have similar phenomena on a smaller scale which we can closely observe, both as regards geographical and time distribution, but are unable to explain from a meteorological point of view. I refer to the continual retrograde motion of the glaciers of the Alps, which you have the opportunity of seeing in the vicinity of the place of our present meeting. Although this phenomenon is proceeding in a district where one may suppose sufficient meteorological observations, both as to time and geographical distribution, are available, we are still unable to determine with certainty a direct connection between the variations or periods of the meteorological elements and the movements of the glaciers.

Great results are not attained suddenly, but only after long and carefully prepared efforts. You have met here, gentlemen, to deliberate upon the means by which we may solve, step by step, the most important meteorological problems of the present day.

Dr. Pernter proposed that a certain number of questions should be referred to special subcommittees which would present reports, with the view of simplifying discussions at the general meetings. Subcommittees were nominated for the consideration of (1) an international code and comparison of the standard barometers of different countries; (2) new edition of the cloud atlas, and the classification of clouds; (3) reduction of the barometer to sea-level, and questions relating to weather-telegraphy; (4) international study of squalls.

A vote of thanks was accorded to Dr. Hildebrandsson for his services as secretary to the International Meteorological Committee, and a telegram was dispatched to M. Mascart, president of the committee, expressing regret at his absence owing to ill-health.

An account of the subsequent meetings of the committee will appear in another issue of NATURE.

SCIENCE TEACHING IN ELEMENTARY SCHOOLS.

THE issue by the Board of Education of the Blue-book[1] that lies before us is a promising sign. Intended as a supplement to the necessarily somewhat rigid and mechanical "Code," it indicates the progress which rational ideas upon elementary education have made in the national councils since the days when Robert Lowe's scheme of "payment by results" could claim rank as a piece of wise statesmanship. The opening words of the "Prefatory Memorandum" show the cautious and reasonable spirit in which these suggestions are made:—

"In issuing this volume the Board of Education desire at the outset strongly to emphasise its tentative character, and to invite well-considered criticism designed to make it more useful for its special purpose."

The Blue-book contains an introduction on the objects of elementary schools, organisation, the curriculum, and the methods applicable to children of different ages, followed by chapters on the teaching of particular subjects, viz. English, arithmetic, observation-lessons and nature-study, geography, history, drawing, singing, physical training, needlework and housecraft, handicraft and gardening, and hygiene. Specimen schemes for most of these subjects are given as a series of appendices.

The suggestions made for arithmetic are of a wise and practical kind, as a few extracts will show:—

"The instruction in arithmetic should be made as realistic as possible. . . . The use of sets of objects will make it possible from the very beginning to teach the children to add, rather than count by units. . . . Multiplication tables should not be learnt before they have been constructed and understood. . . . Every school should be provided with (*a*) foot-rulers graduated. . . (*b*) cords with feet, yards and metres marked upon them, . . . (*d*) a pair of common scales with the smaller weights . . . (*e*) measures of capacity . . . (*f*) squared paper or tracing cloth. . . . The commercial applications of arithmetic commonly found in text-books could be advantageously replaced by algebra, practical geometry and the mensuration of the simpler solids and surfaces."

The chapter on observation-lessons and nature-study emphasises the importance of training in accurate observation and accurate description. The distinction made between the two terms is that observation-lessons are for children under ten, while nature-study is for older ones. This seems an artificial distinction, apparently involving the thesis that by the tenth year there is nothing left for observation by the pupils in elementary schools except the outdoor world. The movement of late years for nature-study has, in fact, involved a confusion of thought between subject-matter and method; and it has come to pass that on the one hand didactic teaching of elementary botany, provided it is accompanied by practical verification, and on the other almost any sort of heuristic teaching, are equally covered by that vague and comprehensive term. We see some trace of this confusion of thought in the following remarks:—

"The main factor which marks off nature-study from other school subjects should be that in it the instruction proceeds solely from the actual object, and never from description or reading. In practically every other subject, no matter how successfully the teacher makes the scholar look for the information he requires, the child has to take things for granted, and must depend on the good faith of the teacher or of the printed book; in nature-study comes the opportunity of proceeding by another method and teaching from the thing itself. The teacher should then be very jealous not to waste this unique opportunity" (pp. 48–49).

If this be interpreted as an attempt to use nature-study as an heuristic wedge to be driven into densely didactic school traditions, we may approve of its practical purpose; but with the more idealistic tone of the whole book it is inconsistent. The whole of the chapter on arithmetic is saturated with the notion of "teaching from the thing itself." So far from

[1] "Suggestions for the Consideration of Teachers and others concerned in the Work of Public Elementary Schools." Pp. 156. (1905.)